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Official application no.: PCT/DE2004/001872
Title: Method for producing components
Applicant: MTU Aero Engines GmbH

In response to the written notice of the International Search Authority (Rule 43 through 1 [sic] PCT) with a sent date of February 17, 2005:

The written notice is based on the prior art from documents D1 through D4; it confirms the novelty of Claims 6 through 10 but negates the inventive step of all Claims 1 through 10.

Enclosed we are submitting a new patent application with five claims. The new Claim 1 combines the features of the original Claims 1, 2 and 5. The new Claims 2 through 5 correspond in their features to the original Claims 7 through 10. The original claims 3, 4 and 6 have been deleted without replacement. All changes are apparent from the handwritten corrections, the original of which is attached (corrections in red).

The new main claim is limited with regard to its preamble (generic part) to a "Method for Manufacturing Components of a **Gas Turbine**..." and no components of other machines are included. In this regard, see the deletion of the term "preferably" in the first line of the original Claim 1.

Gas turbine components—in particular, parts belonging to the rotor—are exposed to high mechanical and thermal stresses during operation. To minimize the risk of breakage, such parts must be as free of defects as possible, i.e., they must not have any weaknesses such as cracks, notches, etc. In the case of composite components produced by powder metallurgy, the connecting surfaces of the molded articles that have been joined constitute especially critical areas.

The proposals made in documents D1 through D3 also pertain to the problems of the connecting points.

[See original for contact information.]

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According to document D1, the joining quality is to be optimized by combining molded articles with only a slight difference in shrinkage behavior (difference max. 5%).

According to D2, the injection molding process itself with a direction of flow parallel to the connecting surface should form the basis for the connection quality. Preheating the first available joint face is also proposed.

According to D3, a jacketed molded body with a higher sintering shrinkage should preferably be used for joining a drilling tool jacket and a drilling tool core so that a press fit is achieved between the molded bodies, supporting the diffusion connection. One disadvantage here is that tensile stresses may remain in the tool jacket and can lead to its breakage, especially when using the drilling tool.

None of the documents makes any reference to a targeted outer pressure exposure during sintering/diffusion, whereby the pressure is no longer present after joining, i.e., the stress on the joint is relieved.

Therefore, we are of the opinion that the new main claim fulfills not only the requirement of "novelty" but also the criterion of "inventive step." The new dependent Claims 2 through 5 should also be grantable.

MTU Aero Engines GmbH

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Enclosed
Patent Claims 1 through 5 (page 1, single copy) by fax and by post
Corrections in red (2 pages, original), only sent by fax

Patent Claims

1. Method for manufacturing components of a gas turbine, in particular of an aircraft engine, by injection molding by the powder metallurgy method, whereby multiple molded articles are fabricated using powder-binder mixtures and each molded body is then to be subjected to a debinding process, whereby each molded body is subsequently compressed or shrunk by sintering to form at least one component having the desired geometric properties, and whereby to produce a component, multiple molded bodies are joined together by a diffusion process during sintering by first bringing the molded articles to be joined together into surface contact at least during the sintering on sections that are to be joined together, characterized in that pressure is applied to the molded articles that are to be joined together during the sintering process.

2. Method according to Claim 1, characterized in that a coating is applied to at least one of the sections of the molded bodies to be joined together to support the diffusion process.

3. Method according to Claim 2, characterized in that the coating or each coating is applied as a film or layer of slip.

4. Method according to any one of Claims 1 through 3, characterized in that when the molded articles that are to be joined together have different shrinkage properties during sintering, the molded article having the greater shrinkage is shrunk onto the molded body having the lower shrinkage.

5. Method according to any one of Claims 1 through 4, characterized in that said method is used to produce blades or blade segments, in particular guide vanes, guide vane segments, rotor blades or rotor blade segments of an aircraft engine or to produce rotors having integral blading.